

B R E V I O R A

Museum of Comparative Zoology

CAMBRIDGE, MASS.

5 APRIL, 1968

NUMBER 283

SCYTHIAN AMMONOIDS FROM TIMOR

Bernhard Kummel

One of the more important areas of ammonitiferous Scythian (Lower Triassic) strata is the island of Timor. The monograph by Welter (1922) on the Lower Triassic ammonoids of Timor is the standard reference. However, an earlier paper by Wanner (1911) did describe four species of Lower Triassic ammonoids. A number of additional comments and descriptions on these Timor ammonoids were contributed by Spath (1934). In the course of a general study of all Scythian ammonoids I have had the opportunity to examine many collections from Timor including the type specimens of the Wanner (1911) and Welter (1922) studies. This note was prepared to make some additions and corrections to our knowledge of Scythian ammonoids of Timor.

Prospiringites austini Hyatt and Smith is recorded for the first time from Timor. This is a common species of *Owenites* Zone age in the circum-Pacific and Arctic regions.

Prenkites sundaicus Welter is established as the type of a new genus, *Vickohlerites*. Previous problems in the interpretation of this species were due to the inaccurate suture illustrated by Welter (1922).

The genus *Parowenites* Spath (1934) was established for an owenitid with a presumed goniatitic suture as illustrated by Welter (1922, pl. 169 (15), figs. 5, 8). Examination of Welter's types clearly shows that the goniatitic suture is the result of excessive grinding and polishing of the specimens. Preparation of other paratypes shows that the suture is ceratitic; hence the genus *Parowenites* Spath is a synonym of *Owenites* Hyatt and Smith.

The genus *Metadagnoceras* Tozer is recognized for the first time from the bed with manganese coated fossils at Nifoekoko. This specimen had previously been noted by Spath (1934, p. 269, footnote) as being "very close to *Dagnoceras terbunicum*."

For the loan of specimens used in this study I am very grateful to Dr. H.K. Erben of Bonn University, Dr. M.K. Howarth of the British Museum (Natural History), and Dr. H.J. MacGillavry of the Geological Institute, Amsterdam University. The laboratory aspects of this study were supported by N.S.F. grant GB-5109X.

SYSTEMATIC PALEONTOLOGY

Class CEPHALOPODA Cuvier, 1797

Subclass AMMONOIDEA Zittel, 1884

Family PROPTYCHITIDAE Waagen, 1895

Genus OWENITES Hyatt and Smith, 1905

Type species, *Owenites koeneni* Hyatt and Smith, 1905

OWENITES SIMPLEX Welter

Plate 1, figures 1-9

Owenites simplex Welter, 1922: 153, pl. 169(15), figs. 1-8; Kutassy, 1933: 606.

Parowenites simplex, — Spath, 1934: 187, fig. 58; Kummel in Arkell *et al.*, 1957: L138, figs. 171-1a,b; Kummel and Steele, 1962: 647.

Owenites kwangsiensis Chao, 1959: 83, 250, pl. 22, figs. 1-6, text-fig. 26b.

Owenites plicatus Chao, 1959: 85, 251, pl. 22, figs. 19-21, text-fig. 26e.

Owenites aff. *plicatus* Chao, 1959: pl. 22, figs. 24, 25.

Owenites costatus Chao, 1959: 83, 249, pl. 22, figs. 10-18, 22, 23, text-fig. 26c.

Owenites costatus var. *lenticularis* Chao, 1959: 84, 249, pl. 22, figs. 7-9, text-fig. 26d.

Spath (1934: 187) established the genus *Parowenites* primarily on the basis of the goniatitic suture of *Owenites simplex* as reproduced by Welter (1922: pl. 169(15), figs. 5, 8). Examination of Welter's type specimens plus a number of paratypes shows that the sutures reproduced by Welter were exposed by grinding and polishing. The specimen which yielded the suture of Welter's figure 8 is apparently lost, as it is not in the collections of the Paleontological Institute, Bonn University.¹ However, the paratype of Welter's plate 169(15), figures 3-5 is available, and this shows clearly that excessive grinding of the lateral area resulted in the simple, goniatitic suture. One of the unfigured paratypes of Welter (Pl. 1,

¹ Abbreviations in this paper: MCZ = Museum of Comparative Zoology; GPIBo = Geologisch-Paläontologisches Institut, Bonn; BMNH = British Museum (Natural History).

figs. 8, 9 of this report) yielded the suture of Figure 3E. As can readily be seen, the two lateral lobes are ceratitic and the whole aspect of the suture is owenitid.

The measurements of 27 specimens of this species are given on Table I, and plotted on the graph of Figure 1. There is considerable variation in the diameter of the umbilicus which interestingly enough is not obvious on casual inspection of the specimens. What is more interesting is that the diameter of the umbilicus can vary from one side of the conch to the other. For instance, one of the paralectotypes (Pl. 1, figs. 3-5) has an umbilical diameter of 3.7 mm on one side and 4.6 mm on the other side of the conch.

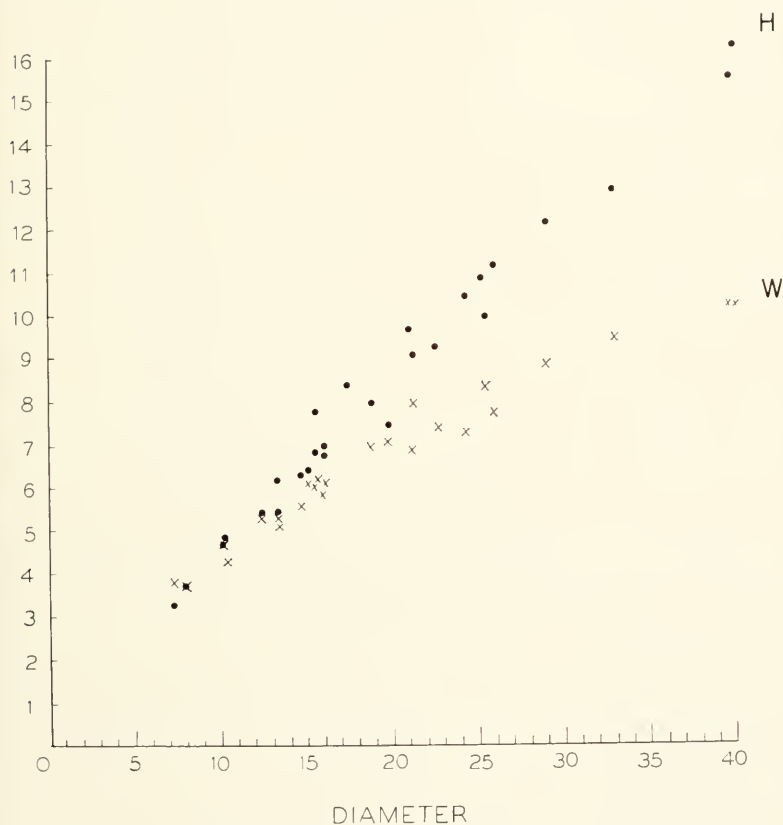


Figure 1. Variation in whorl height (H) and whorl width (W) of *Owenites simplex* from limestone blocks with *Owenites egrediens*, Bahati, Timor.

The form described by Chao (1959) as *Owenites kwangsiensis* from the *Owenites* Zone of Kwangsi, China, I consider to be identical to *O. simplex* Welter (Figs. 3E, H). From the same horizon and locality which yielded *Owenites kwangsiensis*, Chao (1959) described *O. costatus* and *O. plicatus*. Of the first of these species Chao had 17 specimens which he compared mainly with *Owenites pakungensis* Chao; the latter I consider a synonym of *Owenites koeneni* (Kummel and Erben, 1968). *Owenites costatus* does have constrictions and ribs but these are stated to be developed on an irregular pattern, thus differentiated from *Owenites kwangsiensis*. Examination of the 31 specimens from Timor of *Owenites simplex*, representing all growth stages, shows that there is great variation in the pattern of ornamentation. Every one of the specimens of *Owenites costatus* illustrated by Chao (1959: pl. 22, figs. 10-18, 22, 23) can be directly compared to one of the Timor specimens before me. *Owenites plicatus* Chao was established on two fragmentary specimens. On the basis of the description and illustrations of these two specimens I can see no reason for separating them from *O. simplex*. The apparently more simplified suture (fig. 21) was noted by Chao as most probably reflecting immaturity and not a distinctive new pattern. Owenitids of the type of *O. simplex* are only known from Timor and Kwangsi, China.

Occurrence — Dark red limestone blocks with *Owenites egrediens* of Bahati, Timor.

Repository — All specimens are in the Paleontological Institute, Bonn University.

Family PARANANNITIDAE Spath, 1930

Genus PROSPHINGITES Mojsisovics, 1886

Type species, *Prospthingites czekanowskii* Mojsisovics, 1886

PROSPHINGITES AUSTINI Hyatt and Smith

Plate 2, figures 1-16

Prospthingites austini Hyatt and Smith, 1905: 72, pl. 7, figs. 1-4; Frech, 1908, pl. 63, fig. 5; Krafft and Diener, 1909: 160; Diener, 1915: 233; Smith, 1932: 98, pl. 7, figs. 1-4; Spath, 1934: 195-196; Kummel and Steele, 1962: 683; Kummel, 1965: 544.

Prospthingites sp. indet. Spath, 1921: 298, 301.

Prospthingites spathi Frebold, 1930: 20, pl. 4, figs. 2, 3, 3a; Spath, 1934: 195, pl. 13, figs. 1, 2; Tozer, 1961: 58, pl. 13, figs. 1, 2; Kummel and Steele, 1962: 687; Kummel, 1965: 544.

- Prosphingites sinensis* Chao, 1959: 122, 297, pl. 25, figs. 1-5, pl. 27, figs. 1-17, text-figs. 40a-c; Kummel, 1965: 544.
- Prosphingites radians* Chao, 1959: 123, 298, pl. 28, figs. 12-16, text-fig. 39d; Kummel, 1965: 544.
- Prosphingites ovalis* Kiparisova, 1960: 137, pl. 33, figs. 2-4; Kiparisova, 1961: 115, pl. 25, figs. 6-9.
- Prosphingites orientalis* Kiparisova, 1961: 117, pl. 26, figs. 1, 2.
- Prosphingites slossi* Kummel and Steele, 1962: 683, pl. 101, figs. 8-17; Kummel, 1965: 544.

None of the three previous studies on Scythian ammonoids from Timor (Wanner, 1911; Welter, 1922; Spath, 1934) contains any mention of the genus *Prosphingites*. I have available five specimens that can with confidence be assigned to *Prosphingites austini* Hyatt and Smith. These specimens are from Fatoe Kosat and are part of the Jonker Collection of the Geological Institute, Amsterdam University. Measurements (in mm) on four of these species are as follows:

D	W	H	U
34.5	21.7 ?	13.3	11.8
30.8	16.7	13.6	8.4
27.8	?	12.8	7.8
27.2 ?	17.0	11.3	8.2
26.0	18.5	12.3	8.2

The similarity of these Timor specimens with *Prosphingites slossi* Kummel and Steele (1962: 683, pl. 101, figs. 8-17) and other mid-Scythian prosphingitids is indeed remarkable (Pl. 2). Documentation of species of this genus has been slow. The genotype (*P. czezanowskii* Mojsisovics, 1886) is from northern Siberia and of late Scythian age. Hyatt and Smith (1905) then described *Prosphingites austini* from the *Meekoceras* beds of the Inyo Range, southeastern California. Frebold (1930) and Spath (1934) recorded the Spitsbergen species — *Prosphingites spathi* — which they considered late Scythian in age. It was not until the post-war period that descriptions of a number of new species from middle and late Scythian horizons began to appear. These were from Scythian faunas of the Primorye Region (Kiparisova, 1961), southern China (Chao, 1959), New Zealand (Kummel, 1965), and Nevada (Kummel and Steele, 1962). From the mid-Scythian, *Owenites* Zone, the following species of *Prosphingites* are known: *Prosphingites austini* Hyatt and Smith, *P. ovalis* Kiparisova, *P.*

orientalis Kiparisova, *P. sinensis* Chao, *P. involutus* Chao, *P. kwangsiensis* Chao, *P. radians* Chao, *P. spathi* Frebold, and *P. slossi* Kummel and Steele. Most of these species were introduced over a short period of time (1959-1962) and each author was generally without knowledge of the others' activities. We thus have an accumulation of species in which very little comparative analysis accompanied their original descriptions.

When I introduced the species *Prosphingites slossi* (Kummel and Steele, 1962) I was fully cognizant of its close relationship and possible identity to *P. austini* Hyatt and Smith (Pl. 2, figs. 1-3); however, on the argument that *Prosphingites austini* was known only from a single and not a very well preserved specimen, I considered it best to ignore the species. However, subsequently, on study of all new Scythian species that had been introduced, and through restudy of *P. austini*, I am now convinced that *P. slossi* is a synonym of *P. austini*. Kummel and Steele (1962) presented measurements on 49 specimens of *P. slossi* from the *Meekoceras* beds at Crittenden Spring, Nevada. These data show that at least within that population there is considerable variability in conch width and umbilical diameter. This collection also clearly showed that there was considerable variation in the pattern of constrictions.

Of the Timor specimens recorded here, only four yielded complete measurements. The range of umbilical diameters in these four specimens falls well within the range of umbilical diameters in the Crittenden Spring fauna of *Prosphingites slossi*. The whorl width tends, however, to be greater in the Timor forms than in the Nevada fauna. This, however, considering the small size of the sample and the identity or close similarity of the other conch features, is not sufficient reason to even suggest specific distinction. The pattern of ornament, and variations in the nature of the umbilical shoulder and wall are the same. The sutures can be said to be identical (Fig. 2).

Most of the other species placed here in the synonymy of *Prosphingites austini* are known from very few specimens. Large numbers of specimens of *P. spathi* are in the British Museum (Natural History), but only a few measurements are available and nearly all of this Spitsbergen collection consists of small phragmocones or juvenile specimens. It is uncertain from the text but it appears that the fauna of *Prosphingites spathi* from Ellesmere Island studied by Tozer (1961) consists of very few specimens, perhaps only three. Both Spath (1934) and Tozer (1961) have emphasized the variability of this species, including its suture. I can find no criteria by

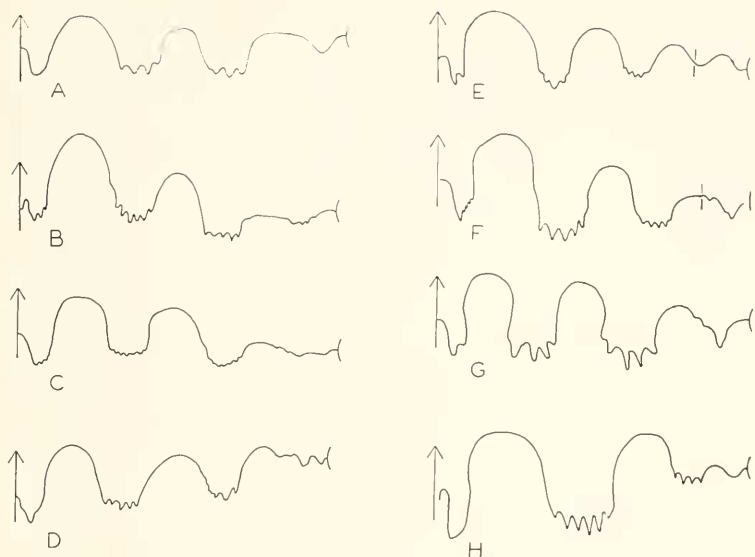


Figure 2. Diagrammatic representation of the suture of: A, *Prosphingites austini* Hyatt and Smith (1905: pl. 7, fig. 4) from *Meekoceras* beds, Union Wash, Inyo County, California, USNM 75256, at a diameter of 20 mm; B, *Prosphingites slossi* Kummel and Steele, from *Meekoceras* beds, Crittenden Spring, Nevada, paratype, at diameter of 18 mm; C, *Prosphingites slossi* Kummel and Steele, from *Meekoceras* beds, Crittenden Spring, Nevada, paratype, at a diameter of 30 mm; D, *Prosphingites spathi* Frebold, from Tozer (1961: pl. 13, fig. 1c) from *Meekoceras* beds, Blind Fiord Formation, Ellesmere Island, at a diameter of 16 mm; E, *Prosphingites spathi* Frebold, from Spath (1934: pl. 13, fig. 1e) from *Owenites* Zone, Spitsbergen; F, *Prosphingites austini* Hyatt and Smith, specimen in Yonker collection, from Timor, Department of Geology, Amsterdam University, at a diameter of 22 mm; G, *Prosphingites ovalis* Kiparisova (1961: fig. 79) from *Owenites* Zone, Primorye Region, at a whorl height of 5 mm; H, *Prosphingites sinensis* Chao (1959: fig. 40a) from *Owenites* Zone, Kwangsi, China, at a diameter of 20 mm.

which one can separate *P. spathi* from *P. austini*. In regards to the age of the Spitsbergen forms it has been pointed out by Kummel (1961) and Tozer (1961) that the beds containing *P. spathi* are of mid-Scythian *Owenites* Zone age rather than late Scythian as believed by Spath.

The mid-Scythian, *Owenites* Zone, strata of the Primorye Region contain, according to L. D. Kiparisova (1961), two species of

Prosphingites, namely, *P. ovalis* Kiparisova and *P. orientalis* Kiparisova. The first of these species, *P. ovalis*, was said to differ from *P. spathi* in its larger shell, oval coiling, more denticulated lobes, and narrower ventral saddle. On close examination none of these criteria are valid. The Arctic *P. spathi* so far is known from very few specimens on Ellesmere Island and several but mainly juvenile forms from Spitsbergen. Even so, size is hardly a parameter for species distinction, especially in a case like this. In regards to the suture, an inspection of Figure 2 demonstrates considerable variability in this respect. The Crittenden Spring fauna also shows considerable variability in details of the suture. The same variability has been noted for *P. spathi* by Spath (1934) and Tozer (1961). Authors continue to place too high a degree of importance on minor variations in suture patterns. Time and trouble generally dictate the representation in a description of only one suture pattern. My own experience has amply shown that the suture is as variable as any other conch feature in most if not all Scythian ammonoids.

From the same horizon and locality in the Primorye Region, Kiparisova (1961) has described *Prosphingites orientalis*. From the two illustrations given by Kiparisova (1961: pl. 26, figs 1, 2), *P. orientalis* differs from *P. ovalis* primarily in the more acute rounding of the umbilical shoulder. The contrast in the nature of the umbilical shoulder of these two species is precisely the same as seen in the fauna of *Prosphingites slossi* from Crittenden Spring, Nevada (Kummel and Steele, 1962: pl. 104, figs. 8-17). The supposed ovate coiling of *P. ovalis* is suspect, as not all of the illustrated specimens show this. Even so, variants showing slightly ovate coiling are common in Scythian ammonoids. Again, I can see nothing in the suture, conch shape or pattern of constrictions in these Primorye forms to separate them from *P. austini*, *P. slossi*, or *P. spathi*.

Among the very large Scythian fauna of Kwangsi, China, Chao (1959) recognized a number of prosphingitids. Among these, *Prosphingites radians* must be considered a synonym of *P. austini* and the other species discussed above. The conch form, pattern of constrictions and suture (Fig. 2) are well within the range of variation of what is here defined as *P. austini*. There is, in addition, *Prosphingites sinensis*, of which I am not as confident in placing in the synonymy of *P. austini*. The description and illustrations of this species leave much to be desired. However, on the basis of available data, I consider it most probable that this species is the same

as *P. austini*. Even the unusual suture, in terms of the other forms combined with *P. austini*, may not be definitive (Fig. 2H).

Prosphingites kwangsiensis Chao (1959: 296, pl. 28, figs. 17-22) is reported to be a smooth form lacking constrictions. The species, however, is based on two incomplete specimens of modest preservation. More satisfactory documentation of this species I suspect would show it to be conspecific with all the forms placed here in *Prosphingites austini*.

Occurrence. — The Timor specimens recorded here are from red limestones at Fatoe Kosat, Timor.

Repository. — Collection of Lower Triassic ammonoids made by Dr. H. G. Jonker during his Timor expedition in 1915-1916. Specimens are deposited in the Timor collection of the Geological Institute, University of Amsterdam.

Genus VICKOHLERITES n.g.

Type species, *Prenkites sundaicus* Welter, 1922

Conch evolute, with depressed whorl section, broad rounded venter, conch smooth except for growth lines. Suture consists of two denticulated lateral lobes and an auxiliary lobe on the umbilical wall. The type species is from an unknown horizon on Timor. Conspecific specimens are present in the *Subcolumbites* fauna of Chios and an indeterminant species (but not conspecific) is present in the *Subcolumbites* fauna of Kotal-e-Tera, Afghanistan (Kummel, 1968).

VICKOHLERITES SUNDAICUS (Welter)

Plate 1, figures 10, 11

Prenkites sundaicus Welter, 1922: 150, pl. 168 (14), figs. 18-21; Kutassy, 1933: 621; C. Renz, 1945: 301; Renz and Renz, 1947: 60; Renz and Renz, 1948: 29, pl. 12, fig. 1; Chao, 1959: 306.

"*Prenkites*" *sundaicus*, — Spath, 1930: 77; Spath, 1934: 188, 209.

Welter (1922) described this species on the basis of a single specimen from Noel Niti, Timor, and was quite positive as to the close relationship of his specimen to *Prenkites malsorensis* Arthaber from the *Subcolumbites* fauna of Albania. This close relationship is difficult to see. *Prenkites* is a more involute form, with depressed whorls which contract on the adoral quarter volution. The umbilical shoulders are subangular and bear fine nodes. The Timor specimen has a diameter of 40.7 mm, an adoral whorl of 21.5 mm, a height of the adoral whorl of 13.2 mm and an umbilical diameter

of 20.3 mm. The conch is evolute, the umbilicus comprising approximately 50 per cent of the conch diameter. The whorls are depressed with the maximum width at the umbilical shoulder. The venter is arched and grades with no perceptible ventral shoulder to the umbilical shoulder which is acutely rounded. The umbilical wall is steep but not vertical. The last half volution of the specimens is body chamber and shows traces of delicate growth lines. The penultimate half volution bears a series of weak forward projecting ridges which are most prominent on the center part of the venter and disappear completely midway between the venter and the umbilical shoulder.

It is in Welter's (1922: pl. 14, fig. 21) representation of the suture that one can pinpoint the uncertainty in interpretation of this form. Welter's drawing of the suture covers only the portion from the venter to the umbilical shoulder, but implied that it was a complete suture. A new drawing of the suture is given on Figure 3J. As can be seen, there are two prominent lateral lobes but the umbilical wall bears a good portion of a fairly large auxiliary saddle and a small but very distinct denticulated lateral lobe. The first author to comment on *Prenekites sundaicus* after Welter was Spath (1930: 77) who remarked "'Prenekites' *sundaicus* Welter, in whorl shape resembles *Columbites*, but in suture line it is closer to *Subcolumbites* . . ." In terms of Welter's representation of the suture this statement is correct. In *Columbites* the second lateral lobe is generally very small consisting of a single prong, whereas in *Subcolumbites* the second lateral lobe, though much smaller than the first, is more highly developed in terms of its breadth and pattern of denticulation. On the basis of suture alone, *Prenekites sundaicus* can not be attached to either *Columbites* or *Subcolumbites*.

There is a general similarity in conch shape of *Prenekites sundaicus* with some groups of *Subcolumbites*. Among the subcolumbitids three distinct groups can be recognized. There is first of all the *perrinismithi* group with a tendency for carination of the venter; secondly, the *dusmani* group with a more marked development of the reticulate ornamentation, and a compressed whorl section, but lacking the tendency toward carination; finally, there is the *robustus-multiformis* group characterized mainly by their depressed whorl section. It is to this last group that *Vickohlerites sundaicus* has great resemblance in conch form. Within the two subfamilies of the Paranannitidae those genera assigned to the Columbitinae tend to have sutures lacking an auxiliary lobe, whereas within the

Paranannitinae an auxiliary lobe is commonplace, as in *Prosphingites*, *Zenoites*, *Chiotites*, etc. It is within this subfamily that *Vickohlerites sundaicus* belongs.

Renz and Renz (1948: 24, pl. 12, fig. 1) have described and illustrated a single specimen from the *Subcolumbites* fauna of Chios as a representative of this species. The general conch form of their specimen is the same as that of the type specimens from Timor. This Chios specimen measures 55.5 mm in diameter, 21.4 mm for the width of the adoral whorl, 19 mm for the height, and 23.5 mm for the width of the umbilicus. The dimensions of the whorl height and umbilical diameter in the two specimens are reasonably similar. However, the Timor specimen has a broader whorl than the Chios specimen by approximately 14 per cent. This difference in whorl width is difficult to evaluate, as each locality has yielded only a single specimen. In addition, the Chios specimen, apparently, does not show the suture. The overall similarity of the Chios specimen to that from Timor is such that, in spite of the differences and lack of data mentioned above, the two specimens should be considered as conspecific.

An undescribed specimen from a *Subcolumbites* fauna at Kotal-e-Tera, Afghanistan, is clearly congeneric with the Timor and Chios specimens discussed above but is not conspecific. There are significant differences in whorl cross-section and in the suture.

Occurrence. — The holotype (Pl. 1, figs. 10, 11) is from Noel Niti, Timor. Welter (1922: 85, 86) considered this specimen to come from his lowest Triassic horizon. He lists (on p. 150) the forms associated with this specimen as *Meekoceras* sp. indet. The available evidence does not allow any precise determination of the age, but the biological affinities of this species suggest that it is late Scythian in age.

Repository. — The holotype is in the Paleontological Institute of Bonn University; the specimen from Chios is in the Natural History Museum, Basel J 13576.

Family MEEKOCERATIDAE Waagen, 1895

Genus METADAGNOCERAS Tozer, 1965

Type species, *Metadagnoceras pulcher* Tozer

METADAGNOCERAS FREEMANI n. sp.

Plate 1, figures 12, 13.

This species is proposed for the specimen from Timor mentioned by Spath (1934: 269, footnote) as "an isolated example of a new

species from Timor . . . which is very close to *Dagnoceras terbunicum*." The specimen measures 47.8 mm in diameter, 14.7 mm for the width of the last whorl, 21.7 mm for the height of the last whorl, and 10.4 mm for the diameter of the umbilicus. The conch is compressed with a low, arched venter and rounded ventral and umbilical shoulders. The suture (Fig. 3D) has a very large first lateral lobe with denticulations extending all along the vertical side to a narrow irregular first lateral saddle. There is a small denticulated second lateral lobe on the umbilical shoulder and wall.

This species does not resemble *Dagnoceras terbunicum* in conch shape; the differences are centered mainly in the character of the venter. In the suture, the first lateral saddle and the first lateral lobe of the two species are quite similar but the remainder of the suture is quite different. In general conch morphology *Metadagnoceras freemani* is quite similar to the type species, *M. pulcher* Tozer. The sutures are similar in basic plan but differ in significant details (Figs. 3A, D). The suture is quite similar to an undescribed species from the Tobin Formation, Nevada, but the whorls are of quite different proportions and the conch much more evolute (Fig. 3B).

Occurrence. — Nifoekoko, Timor, from bed with manganese coated fossils, including *Albanites*, *Prohungarites*, etc.

Repository. — British Museum (Natural History) C33701, holotype.

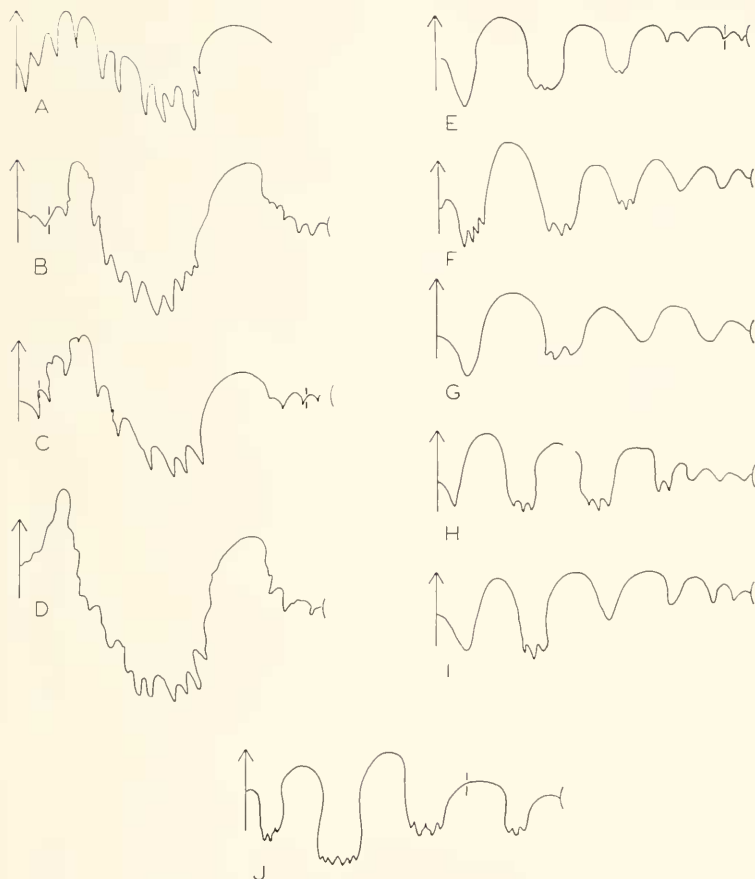


Figure 3. Diagrammatic representation of the suture of: A, *Metadagnoceras pulcher* Tozer (1965: fig. 9), from British Columbia, at a whorl height of approximately 20 mm; B, undescribed new species from Tobin Formation, Nevada, at a whorl height of 11 mm, MCZ 9638; C, undescribed species of *Metadagnoceras* collected by N. J. Silberling from Star Peak Formation, Nevada, at a whorl height of 22 mm; D, *Metadagnoceras freemani* n. sp., holotype, from Nifoekoko, Timor, at a whorl height of 14 mm, BMNH C33701; E, *Owenites simplex* Welter, original drawing based on one of Welter's unfigured paratypes (Pl. 1, figs. 8, 9 of this report) at a diameter of 13 mm; F, *Owenites costatus* Chao (1959: fig. 26c) at a diameter of 20 mm; G, *Owenites costatus* var. *lenticularis* Chao (1959: fig. 26d) at a diameter of 12 mm; H, *Owenites kwangsiensis* Chao (1959: fig. 26b) at a diameter of 25 mm; I, *Owenites plicatus* Chao (1959: fig. 26e) at a diameter of 30 mm; J, *Vickohlerites sundaicus* (Welter), at a diameter of 30 mm, holotype, GPIBo 231.

TABLE 1

Measurements of *Owenites simplex* Welter from Timor

No.	D	W	H	U	W/D	H/D	U/D
1.	39.8	10.3	16.4	10.0	25.9	41.2	25.1
2.	39.6	10.3	15.6	7.2	26.0	39.3	18.2
3.	32.8	9.5?	13.0	13.4	28.9?	39.6	40.8
4.	28.9	8.9	12.2	7.2	30.8	42.2	24.9
5.	25.9	7.8	11.2	6.3?	30.1	43.2	24.3?
6.	25.4	8.4	10.0	8.0	33.1	39.4	31.4
7.	25.1	?	10.9	6.3	?	43.4	25.1
8.	24.2	7.3	10.5	5.8	30.2	43.4	23.9
9.	22.6	7.4	9.3	5.1	32.7	41.2	22.6
10.	21.2	8.0	9.1	5.6	37.7	42.9	26.4
11.	21.1	6.9	9.7?	4.9?	32.7	45.9?	23.2?
12.	19.7	7.1	7.5	6.2	36.0	38.1	31.5
13.	18.8	7.0	8.0	4.0	37.2	42.6	21.3
14.	17.4	?	8.4	3.1?	?	48.3	17.8?
15.	16.1	6.1	7.0	3.8	37.9	43.5	23.6
16.	16.0	5.9	6.8	4.6	36.9	42.5	28.8
17.	15.6	6.2?	6.8	3.8	39.7?	43.6	24.4
18.	15.5	6.1	7.8	4.0	39.4	50.3	25.8
19.	15.1	6.1	6.4	3.7	40.4	42.4	24.5
20.	13.3	5.3	6.2	2.7	39.8	46.6	20.3
21.	13.3	5.1	5.4	3.3	38.3	40.6	24.8
22.	14.6	5.6?	6.3	3.7	38.4?	43.2	25.3
23.	12.4	5.3	5.4	?	42.7	43.5	?
24.	10.4	4.3	4.8	1.6?	41.3	46.2	15.4?
25.	10.1	4.7	4.7	1.5?	46.5	46.5	14.9?
26.	8.0	3.7	3.7	?	46.3	46.3	?
27.	7.3	3.8	3.3	1.1?	52.1	45.2	15.1?

D = diameter; W = width of adoral whorl; H = height of adoral whorl; U = diameter of umbilicus.

No. 2. Lectotype, Welter (1922: pl. 169(15), figs. 1, 2; Pl. 1, figs. 1, 2 of this report) GPIBo 234a.

No. 8. Paralectotype, Welter (1922: pl. 169(15), figs. 3-5; Pl. 1, figs 3-5 of this report) GPIBo 234b.

No. 10. Paralectotype, Welter (1922: pl. 169(15), figs. 6, 7; Pl. 1, figs. 6, 7 of this report) GPIBo 234c.

No. 20. Suture specimen from Bahati, Timor (Pl. 1, figs. 8, 9, Text-fig. 3E of this report) GPIBo.

REFERENCES

ARKELL, W. J. *et al.*

1957. Treatise on Invertebrate Paleontology, Ammonoidea. R. C. Moore ed., Pt. L, Mollusca, **4**, 490 pp.

CHAO, KINGKOO

1959. Lower Triassic ammonoids from western Kwangsi, China. *Palaeont. Sinica*, **145**: 1-355.

DIENER, CARL

1915. Fossilium Catalogus. I. Animalia. Pt. 8, Cephalopoda Triadica. Berlin, 369 pp.

FREBOLD, H.

1930. Die Altersstellung des Fischhorizontes des Grippianiveaus und des unteren Saurierhorizontes in Spitzbergen. *Skr. Svalb. og Ishavet*, **28**: 1-36.

FRECH, F.

- 1903- Lethaea Geognostica. Das Mesozoicum. I, Trias. Stuttgart,
1908. 623 pp.

HYATT, A. and J. P. SMITH

1905. The Triassic cephalopod genera of America. Prof. Pap. U.S. Geol. Surv., **40**: 1-394.

KIPARISOVA, L. D.

1960. Novye vidy drennikh rastenii i besopzvonochnykh SSSR, Chast' 2. Novye rannetriasovye nautilus i prosfingit Yuzhnogo Primorya. Vsesoiuznyi nauchno-issledovatel'skii geologicheskii institut (VSEGEI). [New species of ancient plants and invertebrates of the U.S.S.R., Pt. 2. New early Triassic nautiloids and prosphingitids from the Primorye Region. All Union Sci. Res. Geol. Inst., pp. 136-139.]

1961. Paleontologicheskoe obosnovanie stratigrafii triasovykh otlozhenii Primorskogo kraia. Chast' I. Golovonogie molliuski. Vsesoiuznyi nauchno-issledovatel'skii geologicheskii institut (VSEGEI), trudy. [Paleontological foundation for the stratigraphy of the Triassic deposits of the Primorye Region. Pt. I, Cephalopoda. Trans. All Union Sci. Res. Geol. Inst., N. Ser., **48**: 1-278.]

KRAFFT, A. v. and CARL DIENER

1909. Himalayan Fossils. Lower Triassic Cephalopoda from Spiti, Malla Johar, and Byans. Mem. Geol. Surv. India, *Palaeont. Indica*, Ser. 15, **6**(1): 1-186.

KUMMEL, B.

1961. The Spitsbergen arctoceratids. *Bull. Mus. Comp. Zool.*, **123**: 499-532.

1965. New Lower Triassic ammonoids from New Zealand. New Zealand J. Geol. Geophys., **8**: 537-547.
1968. Additional Scythian ammonoids from Afghanistan. Bull. Mus. Comp. Zool., in press.
- KUMMEL, B. and H. K. ERBEN
1968. Lower and Middle Triassic cephalopods from Afghanistan, Palaeontographica, in press.
- KUMMEL, B. and G. STEELE
1962. Ammonites from the *Meekoceras gracilitatis* zone of Crittenden Spring, Elko County, Nevada. J. Paleont., **36**: 638-703.
- KUTASSY, A.
1933. Fossilium Catalogus. I. Animalia. Pt. 56, Cephalopoda Triadica II. Berlin, pp. 371-832.
- MOJSISOVICS, E. V.
1886. Arktische Triasfaunen. Beiträge zur palaeontologischen Charakteristik der Arktisch-Pacifischen Triasprovinz. Mem. Acad. Imp. Sci. St. Petersburg, Ser. 7, **33**: 1-159.
- RENZ, CARL
1945. Beiträge zur Stratigraphie und Paläontologie des ost-mediterranen Jungpaläozoikum und dessen Einordnung im griechischen Gebirgssystem, Teil I and II. Eclogae Geol. Helvetiae, **38**: 211-313.
- RENZ, CARL and OTTO RENZ
1947. Übersicht über eine untertriadische Ammonitenfauna von der Insel Chios (Griechenland). Verhandl. Naturforsch. Gesell. Basel, **58**: 58-79.
1948. Eine untertriadische Ammonitenfauna von der griechischen Insel Chios. Abhandl. Schweiz. Paläont., **66**: 1-98.
- SMITH, J. P.
1932. Lower Triassic ammonoids of North America. Prof. Pap. U.S. Geol. Surv., **167**: 1-199.
- SPATH, L. F.
1921. On ammonites from Spitsbergen. Geol. Mag., **58**: 297-305, 347-356.
1930. The Eo-Triassic invertebrate fauna of East Greenland. Medd. om Gronland, **83**: 1-90.
1934. Catalogue of the fossil Cephalopoda in the British Museum (Natural History). Part IV. The Ammonoidea of the Trias. London, pp. 1-521.
- TOZER, E. T.
1961. Triassic stratigraphy and faunas, Queen Elizabeth Islands, Arctic Archipelago. Mem. Geol. Surv. Canada, **316**: 1-116.

1965. Latest Lower Triassic ammonoids from Ellesmere Island and northwestern British Columbia. Bull. Geol. Surv. Canada, **123**: 1-45.

WAAGEN, W.

1895. Salt Range fossils. Fossils from the Ceratite Formation. Pt. 1, Pisces-Ammonoidea. Mem. Geol. Surv. India. Palaeont. Indica, Ser. 13, **2**: 1-323.

WANNER, J.

1911. Triascephalopoden von Timor und Roti. N. Jahrb. Mineral. Geol. Paläont., Beil.-Bd., **32**: 177-196.

WELTER, O. A.

1922. Die Ammoniten der unteren Trias von Timor. Paläont. Timor, **11**(9): 83-154.

(Received 11 July 1967.)

EXPLANATION OF PLATE 1

Figs. 1-9. *Owenites simplex* Welter from Timor. Figs. 1, 2, lectotype (Welter, 1922: pl. 169(15), figs. 1, 2) GPIBo 234a, X1; 3-5 paralectotype (Welter, 1922: pl. 169(15), figs. 3-5) GPIBo 234b, X1.5; 6, 7, paralectotype (Welter, 1922: pl. 169(15), figs. 6, 7) GPIBo 234c, X1.5; 8, 9, paralectotype from which suture of Text-figure 3E was taken, GPIBo, X3.

Figs. 10, 11. *Vickohlerites sundaicus* (Welter) from unknown horizon on Timor. Holotype GPIBo 231, X1.

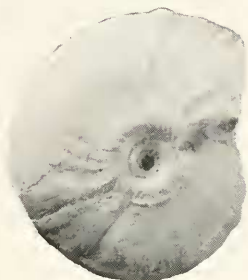
Figs. 12, 13. *Metadagnoceras freemani* n. sp. from beds with managanese coated fossils, Nifoekoko, Timor. Holotype, BMNH C33701, X1.



1



2



3



4



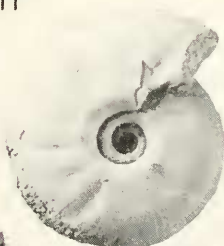
10



11



5



6



7



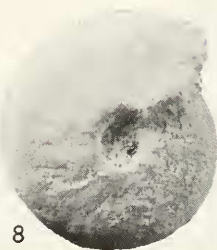
13



12



9



8

EXPLANATION OF PLATE 2

Figs. 1-16. *Prosphingites austini* Hyatt and Smith. Figs. 1-3, from *Meekoceras* beds Union Wash, Inyo Range, California, holotype USNM 75256, X1.5; 3, 4, *Prosphingites slossi* Kummel and Steele, from *Meekoceras* beds, Crittenden Spring, Nevada, paratype MCZ 5781, X1; 6, 7, *Prosphingites slossi* Kummel and Steele from *Meekoceras* beds, Crittenden Spring, Nevada, paratype MCZ 5616, X1; 8, *Prosphingites slossi* Kummel and Steele from *Meekoceras* beds, Crittenden Spring, Nevada, paratype MCZ 5615, X1; 9, 10, *Prosphingites slossi* Kummel and Steele, from *Meekoceras* beds, Crittenden Spring, Nevada, holotype MCZ 5614, X1; 11-16, *Prosphingites austini*, Jonker Collection, Timor, Geology Department, University of Amsterdam, the suture of Text-figure 2F was taken from the specimen illustrated here on figures 15, 16.

